GUAM AGRICULTURAL EXPERIMENT STATION
ISLAND OF GUAM
Under the supervision of the
UNITED STATES DEPARTMENT OF AGRICULTURE

REPORT OF THE GUAM AGRICULTURAL EXPERIMENT STATION

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GUAM AGRICULTURAL EXPERIMENT STATION, ISLAND OF GUAM

[Under the supervision of the Office of Experiment Stations, United States Department of Agriculture]

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REPORT OF THE GUAM AGRICULTURAL EXPERIMENT STATION, 1924

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REPORT OF THE DIRECTOR

By C. W. Edwards

Several adverse conditions materially interfered with the agricultural progress of the island during the fiscal year 1924. The rains from December to June were much lighter than usual and actual drought prevailed during about four months of the period, the few showers occurring being too light to prove of any material benefit. As a result, crops which were planted at the close of the rainy season made low yields and the time of planting the following season was delayed.

A number of serious insect pests, including the coconut scale (*Aspidiotus destructor*), the most destructive and of gravest concern to the island, were found attacking economic plants. The coconut scale practically ruined the coconut crop some years ago on the island of Saipan and certain islands of the Caroline group. (Fig. 1.) The presence of the pest in Guam was unknown locally until its discovery the latter part of December, 1923, when it was found to have become widely distributed over the northern half of the island and to have reached a serious stage in certain restricted areas. Since its discovery, the station staff has devoted considerable time to the work of checking the pest. As an emergency method of control, infested leaves and undergrowth were cut and burned in the most severely attacked areas (fig. 2). Spraying with oil emulsion has not as yet been practiced to any great extent because of the lack of equipment and materials. One natural enemy of the scale,

a small black beetle, identified by Schultze of the Philippine Bureau of Science as *Cryptogonus orbiculus* var. *nigripennis*, has been observed to date.

The crop of taro (*Colocasia esculenta*), which hitherto has been free from insect pests, was practically ruined throughout the island by a leafhopper (*Megamelus* sp.) and the Egyptian cotton worm (*Prodenia litura*). In this connection it was observed that the native yautia, or "piga," was scarcely touched. Powdery and downy mildew of cucurbits and root knot and root rot of beans and tomatoes were very troublesome.

Upon the recommendation of the Governor of Guam that the Chamorro assistant in extension assume entire supervision of the school-garden project, the boys' and girls' club work was dis-

FIG. 1.—Coconut trees showing effects of infestation by the coconut scale, *Aspidiotus destructor*

continued at the close of the season ending October 4. It was desired to lay considerable stress upon gardening in the hope of giving agriculture a larger place in the school curriculum than it now occupies. The clubs made considerable progress under the immediate supervision of members of the station staff, but lately their other duties have left them little time for the work. It was felt, therefore, that greater service would be rendered the island were the assistant in extension to devote his entire attention to the garden work. The station, working in cooperation with the school department, has prepared a set of garden exercises for use in the classroom and, in addition to furnishing plant and seed material for the gardens, is giving general advice and instructions about the work. A total of 13 schools, with an enrollment of 356 pupils in the garden classes, participated in the season's work.

Near the close of the year a general agricultural course was provided for the Piti School. Under the present arrangement the students spend a part of each school day in the classroom and the rest in studying the activities in progress at the station and in doing a certain amount of practical work. It is hoped that as the result of the plan there will ultimately be established on the island an agricultural or farm school.

The valuable timberlands of the island are rapidly becoming depleted and to date very little has been done to reforest the devastated areas. The island is financially unable to undertake the work of reforestation on a large scale, but it would seem that, even under the existing conditions, some progress could be made in this direction. Toward the close of the year the station submitted to the governor for approval a preliminary plan providing for the ap-

FIG. 2.—Coconut grove after treatment for control of coconut scale, *Aspidiotus destructor*. Leaves of trees and undergrowth cut and ready to be burned

propriate annual observance of Arbor Day, growing seedling material mainly by the schools in preparation for Arbor Day planting, establishing forest parks in connection with the schools, and growing plantings on ranches and about homes under the supervision of the chief forester.

Through a transfer of funds near the close of the year, the sum of $5,000 was made available to the station for completing repairs of damage wrought by the typhoon of March, 1923.

LIVESTOCK FEEDING

Through the installation of modern equipment in the local coconut-oil mill, a high-grade coconut meal is now available to the stock farmers of the island. The livestock industry is greatly in need of protein concentrates, and the by-product meal may prove a welcome

addition to the limited supply of locally grown feeds. The station is proving by practical feeding tests that the meal may be advantageously fed as part ration to all classes of stock, and many of the farmers are gradually showing an inclination to profit by the results obtained.

Coconut meal as part ration for horses.—Tests, intermittently made to determine to what extent coconut meal can be substituted for oats for horses, were continued. On account of the lack of weighing facilities at Agaña, where the Navy stables are located, and the small number of horses on hand at the station, the tests have had to be conducted when opportunity permitted and on a limited scale. However, the results for the period indicate that one-third to one-half by weight of the ordinary oat ration of work horses may be replaced by coconut meal, and that in the maintenance ration one-half of the allowance of oats may be replaced. In some instances where

FIG. 3.—Field of Napier grass, *Pennisetum purpureum,* on Upi ranch

the product was consumed in sufficient quantity, the meal without the addition of other grains proved a satisfactory maintenance ration. To date there have been included in the tests 12 work horses, 3 stallions, 4 colts, 4 brood mares, and 5 native ponies.

Horses should be placed on a coconut-meal ration gradually, as it is likely to have a laxative effect. This trouble was of short duration at the station, however.

Coconut meal for brood sows.—Five dry sows on Para grass pasture were kept in good condition when coconut meal was substituted for 50 per cent by weight of the corn in the usual corn-tankage ration.

Napier grass (Pennisetum purpureum).—Napier grass again proved its value as an emergency soiling or pasture crop during drought periods on the few plantations where it was tried. On a ranch at the north end of the island a 10-acre plat of Napier (fig. 3)

aided very materially in saving a grade herd of cattle during the period of extreme forage shortage. The cattle were pastured for short periods at intervals throughout the dry season. During even the height of the drought the Napier grass grew considerably, whereas the native pastures remained at a standstill. Field tests have demonstrated this grass to be well adapted to all classes of the tillable soils of the island. It is urged that more extensive plantings of Napier grass be made.

REPORT OF THE ASSISTANT IN POULTRY HUSBANDRY

By. F. B. Leon Guerrero

CHICKENS

Work with poultry included improving the station flock of Single-Comb Rhode Island Reds through selection, developing a new breed or variety by crossing the Rhode Island Reds with the native stock, improving the Cantonese through selective breeding, and distributing improved breeding stock and eggs for hatching.

According to popular local opinion, each succeeding generation of purebreds raised in the Tropics shows deterioration in size of fowl and in egg-laying qualities. The record of the station's flock of purebred Rhode Island Reds, although consisting of a comparatively small number of birds, seems to indicate that such an opinion is erroneous when the proper methods of care and handling are given the flock. Notwithstanding the fact that no new stock has been introduced into the station flock since February, 1920, each succeeding generation, as compared with the foundation stock, has shown some improvement in egg production and no deterioration whatever in size of fowl.

In the work of establishing a new breed or variety by crossing the Rhode Island Reds with the native stock, the grade progeny shows an increase in size of egg and fowl over the original native parents. The average egg production does not, however, equal that of the parent foundation stock.

The Cantonese is a recent introduction into Guam. The foundation stock was obtained from the Philippine Bureau of Agriculture. The birds are small, plump, and very hardy, and mature early. Attempt will be made to improve by selective breeding the size and uniformity of the breed without sacrificing its desirable qualities. It is thought that the dissemination of Cantonese blood throughout the island will materially improve the native chickens in hardiness and maturing qualities, and result in the establishment of an excellent foundation stock for crossing with purebreds.

Eggs for hatching and surplus breeding stock were again distributed during the year. A total of 482 chicks was reported hatched from the eggs distributed.

REPORT OF THE ASSISTANT IN AGRONOMY AND HORTICULTURE

By Joaquin Guerrero

Crop production was seriously hampered throughout the island during the year by insect pest invasion and a comparatively long, dry season. An outbreak of the coconut scale (*Aspidiotus destruc-*

tor) occurred, menacing not only coconut but also other plants of economic importance. The taro crop was practically ruined for the first time on this island by a leafhopper (*Megamelus* sp.) and the Egyptian cottonworm (*Prodenia litura*).

In continuation of the work dealing with the improvement of tropical fruits and vegetables, the station again introduced a number of economic plants for propagation and distribution.

FORAGE CROPS

Considerable attention was again given to the production of improved forage crops to aid in developing the local livestock industry. New introductions under tests included Vasey, Natal, carpet, Harding, Texas blue, and Merker grasses, sorghum, and sorgo-Sudan.

FIG. 4.—Vasey grass, *Paspalum larranagai*

Vasey grass (Paspalum larranagai).—Seed of Vasey grass was obtained from the United States Department of Agriculture and planted in the regular test plats October 4, 1923. Thirty-four days later some of the plants started to flower. The plants were cut March 29, 1924, when they were 70 inches high, the calculated yield being 8.2 tons per acre. Vasey grass resembles *Paspalum dilatatum* somewhat, but makes a taller, more erect growth, and is not so leafy (fig. 4). It produces an abundance of seed, indicating its ability to spread rapidly.

Natal grass (*Tricholæna rosæ*).—Natal grass, which is indigenous to South Africa, was sown in a small trial plat August 9, 1923. A few of the resulting plants began to bloom October 10, and the crop was cut March 29, 1924, the estimated yield being 5.5 tons per

acre. The grass averaged about 42.6 inches in height and produced slender stems and narrow leaves. When the crop attained its maximum height the outer lower branches became decumbent and almost covered the ground. Natal grass bears delicate white flowers which are readily shattered by the wind. The fineness of the stem adapts Natal grass to growing in the Tropics as a hay crop.

Carpet grass (Axonopus compressus).—A small lot of carpet grass seed received from the United States Department of Agriculture was sown in flats at the station, but produced few plants. These were set in the field August 2, 1923. Carpet grass is of creeping habit and resembles awn grass (*Andropogon aciculatus*), except that the former is awnless, which is an advantage for pasturing. Carpet grass probably will be used locally as a pasture grass.

Harding grass (Phalaris stenoptera).—Seed of Harding grass was obtained from the California Agricultural Experiment Station and planted at the station. The few plants which resulted are making fairly good growth.

Texas bluegrass (Poa arachnifera).—Seed of Texas bluegrass was also obtained from the California station and was planted October 30, 1923. At the close of the year the crop was making good growth. Texas bluegrass may be of service to the island as a pasture grass.

Merker grass (*Pennisetum merkerii*).—A small lot of Merker grass seed was sown in flats, and the resulting plants were transferred to the field August 9, 1923. The first seed spikes were observed 64 days after planting. The first cutting was made March 29, 1924, when the plants were about 97.8 inches high, and yielded approximately 18 tons per acre. Merker grass is very similar in appearance to Napier grass (*Pennisetum purpureum*), but has more numerous hairy stems and seed spikes than the latter (fig. 5).

Sorghum (*Holcus sorghum* [*Andropogon sorghum*]).—The natives of Guam have not as yet adopted the growing of sorghums to any great extent, and the comparatively small quantity that is raised is used mainly as poultry feed. Shallu, or Egyptian wheat, and White Yolo, were tested during the year. The average yield of shallu in three cuttings was 963 pounds of grain and 6.072 tons of forage per acre. The station distributed to various local farmers a large quantity of shallu seed, which is generally preferred as a poultry feed because of its heavy grain yield.

Seed of White Yolo was obtained from the California Agricultural Experiment Station. It is a dwarf variety and was only a partial success, the heads being attacked by larvæ before ripening. The average yield of White Yolo in three cuttings was 543.33 pounds of grain and 4.246 tons of forage per acre.

Sorgo-Sudan.—Seed of sorgo-Sudan, the result of a cross between sorghum and Sudan grass (*Andropogon sorghum sudanensis*), was presented to the station for test by a seed firm in the States (fig. 6). The planting made satisfactory growth, producing in three cuttings an average of 357.72 pounds of grain and 7.37 tons of forage per acre. The forage was readily eaten by the station stock.

Fertilizer test with forage crops.—During the year a fertilizer test was begun with the three leading coarse forage crops of the island. Guatemala grass, Napier grass, and Japanese cane were planted October 25, 1923, in a series of three plats each. Each series

is receiving semiannually one of three treatments: (1) Burnt lime (local), applied at the rate of 2 tons per acre; (2) barnyard manure, applied at the rate of 10 tons per acre; and (3) burnt lime and barnyard manure applied in combination. One cutting of each crop was made. Napier grass made the quickest growth and was cut about two months earlier than were the other two crops. In their first crop, Napier grass and Japanese cane plats receiving the lime and manure in combination made the highest yield, followed by the plats receiving lime alone. The reverse was true with the Guatemala grass, the plat receiving lime producing the best yield, that receiving manure the second best yield, and the plat treated with lime and manure in combination the lowest yield. The test is being continued.

FIG. 5.—Merker grass, *Pennisetum merkerii*

ADLAY (COIX LACHRYMA-JOBI)

The term "adlay," according to P. J. Wester of the Philippine Bureau of Agriculture, is used to designate the soft-hulled group of varieties of *Coix lachryma-jobi*. The plant is grown as a food crop in India, the Philippines, and a number of other countries. If it proves adapted to Guam conditions it probably can be grown to advantage both as a food for human consumption and as a feed, especially for poultry.

Adaptation tests with adlay were begun in December, 1922, when a small lot of seed introduced from the Philippines was planted. One crop was obtained from this planting, and two crops were harvested from a variety test started in March, 1923. All crops made a good stand and growth of forage. Many of the heads,

however, bore a number of grains which failed to fill. This condition was noticed especially in the first planting, which for the most part was grown during the dry season. The unfilled grains are quickly detected by their grayish-white appearance. Table 1 gives the results of the variety test with adlay.

FIG. 6.—Sorgo-Sudan. White Yolo sorghum in right background

TABLE 1.—*Results of adlay variety tests*

Variety	Date planted	Date of first heading	Date of first maturing	Date of first harvesting	Height	Yield per acre			
						First crop		First ratoon	
						Grain	Forage	Grain	Forage
	1923	1923	1923	1923	*Inches*	*Pounds*	*Tons*	*Pounds*	*Tons*
Cotabato	Mar. 3	June 18	Aug. 10	Sept. 26	94.8	1,875.0	13.0	1,450.0	2.0
Batangas	---do----	June 15	Aug. 7	---do----	96.4	2,587.5	18.5	1,637.5	3.2
Davao	---do----	June 10	Aug. 1	Aug. 18	89.0	2,600.0	15.5	1,400.0	3.3
Lamao	---do----	May 25	July 14	---do----	75.8	3,700.0	11.0	1,700.0	2.9
Bukidnon	---do----	June 12	July 18	Sept. 26	98.2	1,887.5	16.0	1,475.0	3.0
Mount Province	---do----	May 23	June 26	Aug. 18	67.4	2,387.5	4.0	637.5	1.5
La Union	---do----	June 8	July 30	---do----	92.8	2,675.0	11.0	1,975.0	2.2
Mumungan	---do----	June 2	July 25	---do----	75.2	4,337.5	7.0	1,200.0	3.5
Lamao White	---do----	May 23	July 21	---do----	82.2	2,262.5	4.5	1,262.5	1.4
	1922								
Miscellaneous	Dec. 14	----------	----------	Aug. 7	-------	480.0	3.42	---------	-------

LEGUMES

Cover crop efficiency tests.—In other years a number of legumes were grown as cover crops, but no comparative tests were made until the past year to learn the cost of growing each crop and the length

of time it efficiently covers the ground and keeps down weed growth. One test, conducted on one-fifth acre plats, with velvet beans (Black Mauritius), cowpeas (Groit), pigeon peas (British West Indies), and mungo beans was completed during the year. The cost of production was highest for the velvet beans and the pigeon peas, there being only a slight difference between them in this respect, and of the two the pigeon peas kept down weed growth for much the longer period of time. The pigeon peas required a longer period of cultivation than did the other crops, but the cost of the work was made comparatively low by the use of the cultivator. With the vine crops, on the other hand, it was necessary to resort to hand cultivation after vining had begun. The mungo beans, followed by cowpeas, covered the ground in the shortest time, but the former followed by the latter also occupied the ground for the shortest time. It was also observed that the pigeon peas were much less damaged by heavy continuous rains than were the other crops. The work is being continued.

TREATMENT OF NEWLY BROKEN GRASSLAND

Two crops were grown during the year in continuation of tests made to determine the relative efficiency of barnyard manure, lime, sulphur, and green manure for newly broken grassland. As was formerly the case, barnyard manure gave the highest yields. The total grain yield of the two crops more than doubled that of the untreated plat. Of the treated plats, the one receiving the green manure made the poorest yields. Data are being compiled for presentation in tabulated form at the conclusion of the test.

ROTATION V. CONTINUOUS CULTURE

Two crops were obtained from the test in which corn, cowpeas, and velvet beans are being grown in rotation and in continuous culture, making a total of seven crops completed to date. It was observed that the sixth crop, which was planted in time to mature during the wet season, produced a better yield than the seventh crop, which matured during the dry period. Both crops made a higher yield on the rotated than on the unrotated plats. The test is being continued to include one more planting, which will conclude the work.

ROOT CROPS

Sweet potatoes (Ipomœa batatas).—The sweet potato or "camote" is one of the most important of the locally grown root crops, but within recent years it has made low yields throughout the island. No new seed having been introduced into Guam for 10 years previous to 1923, deterioration in yield was attributed to the long-continued practice of propagating from cuttings without regard to selection. The introduced roots of eight varieties were therefore planted for the production of new seed material for distribution and for experimental purposes. The seed was very much needed and appreciated by the farmers, as was evinced by their numerous demands on the station for cuttings.

A combined variety and fertilizer test comprising two plantings of seven native and the eight imported varieties was conducted dur-

ing the year (fig. 7). Half of each variety plat was treated with fertilizer, and the rest was left to serve as a check. The results of the tests are given in Table 2.

TABLE 2.—*Effect of fertilizers on yield of different varieties of sweet potatoes*

Variety	Treatment per acre	Estimated acre yield from first crop		Estimated acre yield from second crop		Average yield	
		Fertilized	Unfertilized	Fertilized	Unfertilized	Fertilized	Unfertilized
		Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Imported:							
Southern Queen	Acid phosphate, 250 pounds; sodium nitrate, 100 pounds.	1,801.25	1,072.50	9,600	8,320	5,700.63	4,696.25
Nancy Hall	Acid phosphate, 250 pounds; ammonium sulphate, 75 pounds.	4,757.50	1,457.50	8,000	7,200	6,378.75	4,328.75
Yellow Jersey	Acid phosphate, 250 pounds; sodium nitrate, 100 pounds.	1,760.00	1,058.75	7,200	6,400	4,480.00	3,729.38
Triumph	Acid phosphate, 250 pounds; potassium sulphate, 90 pounds.	9,528.75	5,857.50	12,800	11,680	11,164.38	8,768.75
Porto Rico	Acid phosphate, 250 pounds; barnyard manure, 3,000 pounds.	2,048.75	1,127.50	10,880	11,680	6,464.38	6,403.75
Pumpkin	Acid phosphate, 250 pounds; nitrate of lime, 100 pounds; potassium sulphate, 90 pounds.	660.00	247.50	9,440	9,600	5,050.00	4,923.75
Strassburg	Acid phosphate, 250 pounds; sodium nitrate, 100 pounds; potassium sulphate, 90 pounds.	4,647.50	1,883.75	14,720	12,320	9,683.75	7,101.88
Big Stem Jersey	Acid phosphate, 250 pounds; ammonium sulphate, 75 pounds; potassium sulphate, 90 pounds.	1,430.00	618.75	7,200	5,920	4,315.00	3,269.38
Native:							
Amarillo	Acid phosphate, 250 pounds; sodium nitrate, 100 pounds.	----	----	4,800	3,200	4,800.00	3,200.00
Patas Ñgañga	Acid phosphate, 250 pounds; ammonium sulphate, 75 pounds.	----	----	7,200	6,400	7,200.00	6,400.00
Peru	Acid phosphate, 250 pounds; nitrate of lime, 100 pounds.	----	----	8,000	6,400	8,000.00	6,400.00
Yap	Acid phosphate, 250 pounds; potassium sulphate, 90 pounds.	----	----	13,120	10,400	13,120.00	10,400.00
Mamaka	Acid phosphate, 250 pounds; barnyard manure, 3,000 pounds.	----	----	1,440	960	1,440.00	960.00
Dago	Acid phosphate, 250 pounds; nitrate of lime, 100 pounds; potassium sulphate, 90 pounds.	----	----	640	1,120	640.00	1,120.00
Alalag	Acid phosphate, 250 pounds; sodium nitrate, 100 pounds; potassium sulphate, 90 pounds.	----	----	1,280	1,120	1,280.00	1,120.00

Of the various fertilizers used, acid phosphate in combination with sulphate of ammonia gave the highest percentage of increase in average yield of the fertilized over the unfertilized plat, with the imported varieties; with the native varieties, acid phosphate, both when combined with nitrate of soda and with barn manure, gave the best results in this respect.

In the first crop, grown during the rainy or off-season, the native varieties failed to yield any tubers whatever, whereas the imported varieties produced a fair yield. Triumph made the highest yield, followed by Nancy Hall. Pumpkin gave the poorest results. In the

second crop the average total yield made by the introduced varieties was more than twice that produced by the native varieties. In other parts of the island where soil conditions are more favorable to sweet-potato growing than they are at the station, the introduced varieties gave still better results. Of the imported varieties, Strassburg made the highest yield followed by Triumph, while Yellow Jersey and Big Stem Jersey gave the lowest yields. Of the native varieties, Yap outyielded all the others. Yap is considered one of the hardiest of the native varieties, but it has poor quality and flavor as compared with such other native varieties as Amarillo and Dago. Of the imported varieties, Nancy Hall, Porto Rico, and Pumpkin are generally preferred to the others because of their flavor and cooking qualities.

Yams (*Dioscorea* spp.).—Two imported and five native varieties of yams were planted in December, 1923, in a comparative test made to determine the effect of trellising on yield.

FIG. 7.—Sweet potato variety and fertilizer test. Plats in foreground fertilized, in background unfertilized

Taro (*Colocasia esculenta*).—The taro investigations were seriously interrupted by a leafhopper and Egyptian cotton worm, which entirely destroyed the leaf growth of one crop. The pests were first reported from the southern districts of the island, but soon spread everywhere. They remained a comparatively short time, however. Only one harvest with low yield was obtained from the test, and even this was made possible only through control of the insect pests by the application of an arsenical dust. The crop was planted July 20, 1923, and harvested March 31, 1924. Manila made an estimated yield of 1,280 pounds per acre; Pacencia, 1, 540 pounds; Apaca, 1,125 pounds; Visaya, 1,935 pounds; and an imported variety, 3,800 pounds.

FRUIT INVESTIGATIONS

Mango.—Both the Saipan and the Carabao varieties of mango produced heavy crops throughout the island. Some of the Carabao trees at the station fruited for the first time. The introduced varieties Totafari No. 926 and Red No. 11 also made good yields. Their fruit, however, is decidedly inferior in quality to that of the Carabao.

Roselle.—Two varieties of roselle, Rico (red) and Archer (white), received from the Philippine Bureau of Agriculture, were planted May 21, 1923, in $\frac{1}{12}$-acre plats, and harvested January 21, 1924. Rico made an estimated yield of 5,000 pounds per acre and Archer 4,400 pounds of fruit of fine quality. The red variety, however, is much to be preferred to the white, which is less crisp and juicy and bears a calyx having rather hairy growth.

Citrus.—A few of the introduced citrus trees fruited during the year. One tree of Valencia Late yielded 154 fruits weighing 96¼ pounds, and one of the Washington Navel 19 fruits weighing approximately 17 pounds. Of the other imported trees a few made light yields.

Pineapples.—The fertility test with pineapples, begun September 8, 1921, was completed. Three crops were obtained from the planting, which included the Smooth Cayenne and the locally termed "Thorny Red" or "Ceylon" varieties. The yield from the first crop was the lightest and that from the second crop the heaviest. Sodium nitrate, followed by ammonium sulphate, produced the highest yields in the Smooth Cayenne variety, with about only 3 per cent difference in the yield of the two plats. In the Thorny Red variety, the plat receiving ammonium sulphate gave the best results and that treated with sodium nitrate came next. The difference in this instance amounted to 22.5 per cent. In general, ammonium sulphate produced the largest fruits in both varieties. The treated plats gave an average increased yield over the check plats of 77.8 per cent for the Smooth Cayenne variety, and 87.8 per cent for the Thorny Red variety. Table 3 gives the results of the test.

TABLE 3.—*Effect of fertilizers on yield of two varieties of pineapples*

Treatment per acre	Smooth Cayenne variety					Thorny Red variety				
	First crop	Second crop	Third crop	Total	Average weight of each fruit	First crop	Second crop	Third crop	Total	Average weight of each fruit
	Tons	*Tons*	*Tons*	*Tons*	*Pounds*	*Tons*	*Tons*	*Tons*	*Tons*	*Pounds*
Sodium nitrate, 800 pounds	1.996	2.269	2.548	6.813	2.604	2.132	2.691	1.110	5.933	1.701
Ammonium sulphate, 600 pounds	.320	4.782	1.499	6.601	4.037	1.417	3.134	1.587	6.138	2.085
Bone meal, 3,000 pounds	.559	3.719	1.839	6.117	4.009	1.894	.463	.436	2.793	1.423
Lime, 4,000 pounds	.484	2.596	2.214	5.294	3.238	.579	1.144	.286	2.009	1.676
Barnyard manure, 12 tons	.259	2.582	2.513	5.354	3.509	1.063	1.764	.497	3.324	1.906
Sulphur, 3,000 pounds	.225	4.339	1.322	5.886	3.857	.341	1.519	.510	2.370	2.416
Check (untreated)	.647	2.732	-------	3.379	3.875	1.444	.313	.245	2.002	1.670

GARDEN-VEGETABLE DEMONSTRATIONS

Selection and cross-breeding work with tomatoes constituted one of the principal projects of the garden-vegetable demonstrations. As was formerly the case, the work was seriously handicapped by nematode disease and a root-rot, apparently due to Rhizoctonia, and many of the plants from each crop were lost. However, sufficient healthy plants were saved to permit of continuing the work.

SEED AND PLANT DISTRIBUTION

The naval government of Guam again continued to pay for all the garden-vegetable seed which was imported for distribution. All introduced seed is now sold at cost instead of being distributed free of charge, as was formerly done. During the year 1,147 packets of vegetable seed were sold to the public and 989 packets were distributed free of charge to the schools and other government departments. Distribution of seeds and plants grown at the station continues to be made free of charge. The general distribution during the year included 477 packets of vegetable seed, 3,930 economic plants, 4,806 rooted cuttings of ornamentals, 425 Smooth Cayenne pineapple suckers, 39 grafted Carabao mangoes, 1,514 papaya plants, 80 sacks of imported sweet potato cuttings, 12 sacks of Paspalum grass, and a few pounds of leguminous seed for use as cover crops.

METEOROLOGICAL OBSERVATIONS, 1923–24

TABLE 4.—*Condensed meteorological data for the fiscal year 1924*

Month	Temperature					Total precipitation	Prevailing direction of the wind
	Maximum	Minimum	Mean maximum	Mean minimum	Monthly mean		
	Degrees F.	*Degrees F.*	*Degrees F.*	*Degrees F.*	*Degrees F.*	*Inches*	
1923							
July	90.0	68.0	86.46	75.20	80.830	16.37	Northeast.
August	89.5	69.0	86.32	75.06	80.690	13.36	Southwest.
September	90.0	69.0	85.82	75.50	80.660	12.86	West.
October	92.0	64.0	87.12	74.81	80.965	15.04	East.
November	90.5	72.5	87.89	76.16	82.025	9.33	Do.
December	89.0	73.0	87.37	75.59	81.480	3.44	Do.
1924							
January	89.0	65.0	86.20	72.41	79.305	3.29	Northeast.
February	88.0	71.0	85.83	74.28	80.055	2.65	East.
March	89.0	70.0	87.16	74.26	80.710	1.07	Do.
April	90.0	71.0	88.03	74.97	81.500	1.95	Do.
May [1]	90.0	73.5	88.50	75.92	82.210	3.05	Northeast.
June [1]	90.0	73.0	88.56	75.82	82.190	5.65	Do.
Total						88.06	

[1] May and June, 1924, not verified by Weather Bureau; these forms not received.

The season was characterized by the light rainfall from December to June, the lack of moisture being reflected in the crops and pastures of the islands.

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